**School/Organisation**

St. Andrew’s Secondary School

**Team Name**

**Team Members**

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**Project Title**

RoboStudy Buddy

**🧠 The Problem**

* - Students studying alone at home face distractions and low motivation.
* - Lack of structure reduces productivity.
* - Difficult for teachers and parents to monitor focus remotely.

**💡 Our Solution**

* - An AI-powered tabletop study companion.
* - Combines productivity tools, smart sensors, and gamification.
* - Helps students build better habits through personalized support.

**✨ Key Features**

**⏱️ Pomodoro Timer**

* - Uses the Pomodoro Technique to alternate study and break periods.
* - 25-minute study sessions followed by 5-minute breaks.
* - Longer 15–20 minute breaks after 4 Pomodoros.
* - WRGB LEDs change color to indicate session phases.
* - Break detection system confirms user is resting.
* - Lighting system notifies when break is over.
* - Hardware: Controlled by a microcontroller (ESP32), interfaced with WRGB LED strips, and powered by a rechargeable Li-ion battery pack or USB-C power.

**🌈 Intelligent Lighting System**

* - WRGB LEDs simulate full color spectrum including true white.
* - Custom lighting for focus, relaxation, and alertness.
* - Individually addressable LEDs controlled via GPIO.
* - Red flashing lights activate when user loses focus.
* - Reduces wiring from 5 to 3 connections for hardware efficiency.
* - Hardware: WS2812B LEDs connected to ESP32 via GPIO pin, with capacitor/resistor circuit for protection and power supply.

**🤖 AI Study Assistant**

* - Offers real-time explanations, summaries, and brainstorming help.
* - Supports both voice and text input for accessibility.
* - Integrates APIs from OpenAI or Perplexity for intelligent responses.
* - Runs on Raspberry Pi 4 or ESP32 with Wi-Fi for cloud communication.
* - Uses a microphone (I2S or USB) for voice input.
* - Audio output via speaker or audio module.
* - Display via small touchscreen or OLED screen.
* - Adapts to user preferences in tone and format over time.

**📹 Distraction Detection + Vibration Alarm**

* - Camera with eye-tracking detects loss of focus.
* - Triggers voice alerts and vibrations when distractions are noticed.
* - Flashing LEDs reinforce attention redirection.
* - Future concept: non-invasive mind-reading system for cognitive feedback.
* - Ethical design: no data stored for more than 5 minutes.
* - Hardware: USB camera or ESP32-CAM module, vibration motor module controlled by MOSFET, powered by onboard battery or USB.

**📊 Personalized Study Coach**

* - Tracks Pomodoro sessions, focus patterns, and breaks.
* - Suggests optimal study schedules based on collected data.
* - Learns from usage habits to provide personalized tips.
* - Stores data locally or syncs to cloud via Firebase.
* - Uses TensorFlow Lite for lightweight behavior analysis.
* - Feedback via LEDs, vibration motors, or on-screen alerts.
* - Predicts ideal study times and strategies.
* - Integrates with mobile apps or desktop dashboard.

**🎮 Gamified Focus System**

* - Users earn "Focus Points" for completed study blocks.
* - Points unlock rewards like playlists, motivational messages, or break activities.
* - Reinforces consistency through daily/weekly streaks.
* - Uses dopamine-based reward loops to make studying engaging.
* - Builds long-term habits through behavioral psychology.
* - Turns discipline into a fun challenge.
* - Hardware: Points and streaks tracked in software; rewards trigger audio, light effects, or access via app; optional buzzer or haptic motor for celebration cues.

**📈 Productivity Dashboard**

* - Visual dashboard with graphs, heat maps, and timelines.
* - Shows study streaks, Pomodoro counts, and peak performance times.
* - Identifies distraction patterns and productive windows.
* - Syncs with Google Calendar or Notion for reminders and summaries.
* - Allows custom study goals and real-time tracking.
* - Encourages accountability through data-driven motivation.
* - Hardware: 2.4" TFT or OLED display (e.g., ILI9341), optional BLE sync with companion mobile app, connected via SPI/I2C to ESP32.

**🗣️ Voice Control Mode**

* - Set timers, ask questions, and log goals by voice.
* - Uses I2S or USB microphones for input.
* - Wake word detection (e.g., “Hey Buddy!”) to activate.
* - Processes commands locally or through cloud NLP.
* - Outputs feedback via speaker or LED indicators.
* - Backup control through physical buttons or mobile interface.
* - Enables hands-free use for uninterrupted studying.

**Future Developments**

**📅 Smart Scheduler**

* - Syncs with calendar to analyze deadlines and workload.
* - Recommends study windows based on energy levels.
* - Adjusts sessions dynamically to handle unexpected changes.
* - Uses time-blocking and adaptive scheduling for balance.
* - Prevents burnout with intelligent workload distribution.
* - Hardware: Uses internet-connected MCU to sync data with cloud calendar; scheduling logic handled via local database or cloud backend; updates shown on onboard screen or companion app.

**🔗 App & Tool Integration**

* - Connects with Google Calendar, Notion, Anki, and more.
* - Tracks study goals across multiple platforms.
* - Enables notifications, progress syncing, and task updates.
* - Hardware: BLE module or Wi-Fi MCU (ESP32) enables wireless syncing with apps and services.

**Hardware**

* Controller: Raspberry pi
* camera: raspberry pi camera
* lights: WRGB addressable lights
* AI: teachable machine